

The Rare Isotope Accelerator: R&D Workshop

A Project Perspective on R&D Priorities
Based on Risk and Opportunity

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Presented by:

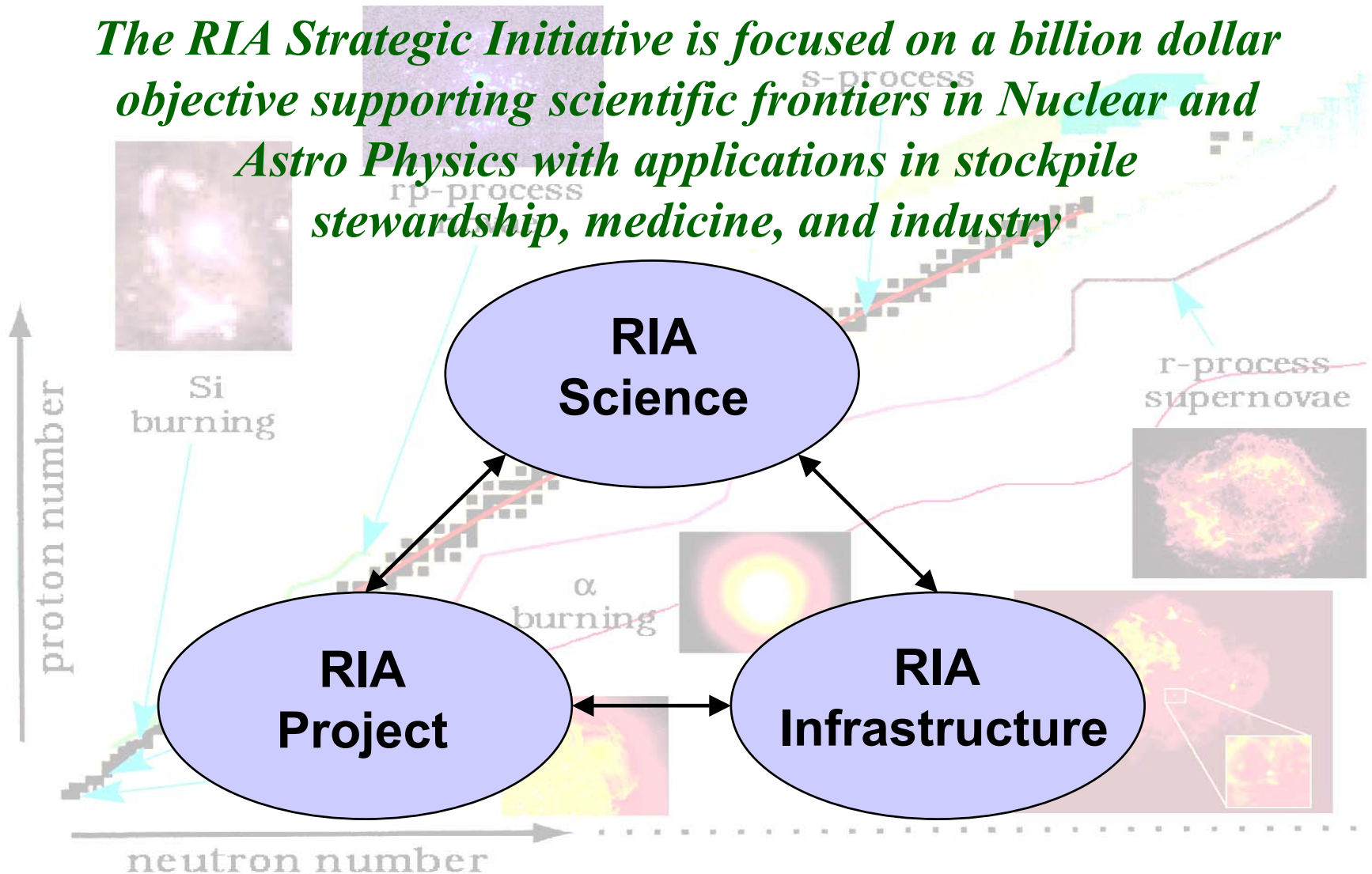
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RIA Overview Summary

The RIA Strategic Initiative is focused on a billion dollar objective supporting scientific frontiers in Nuclear and Astro Physics with applications in stockpile stewardship, medicine, and industry



Project Perspective on R&D Priorities

- **Introduction**

- The process of turning an R&D program into a construction line item involves many interdependent actions. Most of these actions can be prioritized through a process of risk identification and evaluation
- Quickly learning the immediate technical issues for a complex system can be facilitated through the use of a risk assessment process
- For RIA – the end results of this risk assessment process is a managed list of opportunities in the delivery of a major project. It helps us.....
 - ✓ *Address Cost Issues – Reinforce Cost Range*
 - ✓ *Clarify Design Focus – Reinforce Contingency Estimates*
 - ✓ *Clarify Performance Objectives – Solidify Technical Baseline*

Project Perspective on R&D Priorities

- **Methodology**

- **Focus** on the Harrison Committee Cost Estimate and Physics Baseline from the 2nd RIA Driver workshop – no updates or changes
 - ✓ *RIA technology is documented in journal articles, conference proceedings, workshop briefings, etc.....lends itself to a qualitative assessment tool such as Delphi Method*
- **Assess** each major element of the RIA project against performance objectives. Answer the question – “With no modification, can the technology described in the report deliver....”
 - ✓ *100 kW Beam Power with upgrade path to 400 kW?*
 - ✓ *400 MeV per nucleon uranium?*
 - ✓ *Four energy regimes for experimentation?*
- Use engineering judgment to assess consequence of technology success or failure in three baseline categories – Cost, Schedule and Technical performance
- **Evaluate** Risk based on likelihood of success with current technology and a “need” date driven by project objectives
- **Establish** priorities based on highest risk and nearest need date – put the process and the results under configuration control

Project Perspective on R&D Priorities

- **Initial Results**

- 52 Items that represent threat or opportunity based on consequences with highest potential for impact in Cost, Schedule or Technical performance
- RIA Sub System Categories that Drive Threats and Opportunities
 - ✓ *Beam Dynamics*
 - ✓ *Driver Linac*
 - ✓ *Lithium Production Target*
 - ✓ *Fragment Separator*
- We already know these are significant areas of focus so additional perspective is needed
 - ✓ *Need to translate the 2nd RIA Driver workshop physics baseline into an engineering baseline to find “holes”*

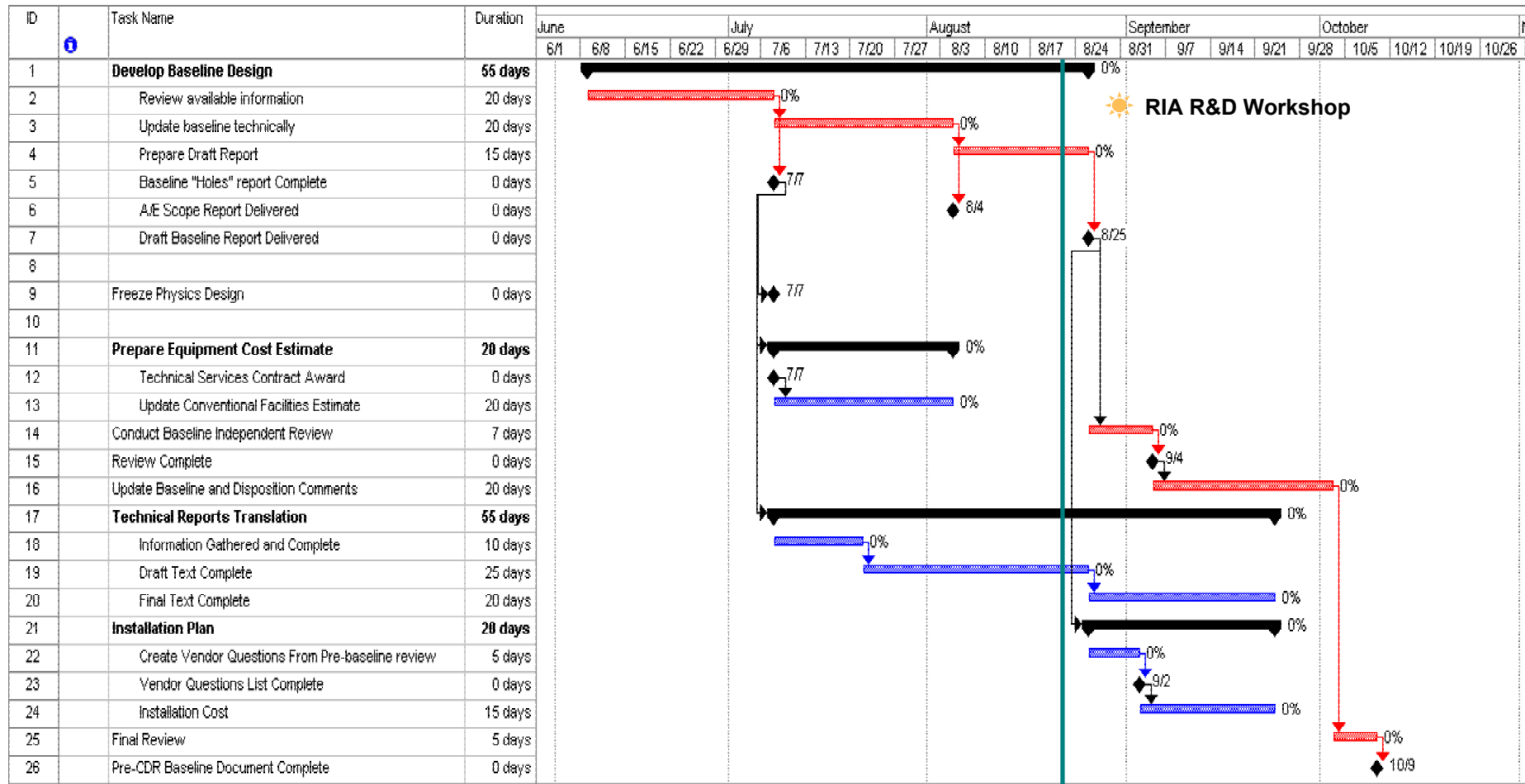
Project Perspective on R&D Priorities

- **Gaining Perspective**

- Establish a team of experts from:
 - ✓ *Physics Division*
 - ✓ *Advanced Photon Source*
 - ✓ *Nuclear Engineering, and*
 - ✓ *ANL West*
- Charge them to:
 - ✓ *Translate the 2nd RIA Driver workshop physics description into physics parameters*
 - ✓ *Ensure the physics parameters are reflected in a non-site specific engineered layout*
 - ✓ *Verify the elements in the Harrison Committee cost estimate*
 - ✓ *Report on any holes*
 - ✓ *Do this in ~90 days – Start June 14th*

Project Perspective on R&D Priorities

- Pre-CDR engineering baseline schedule

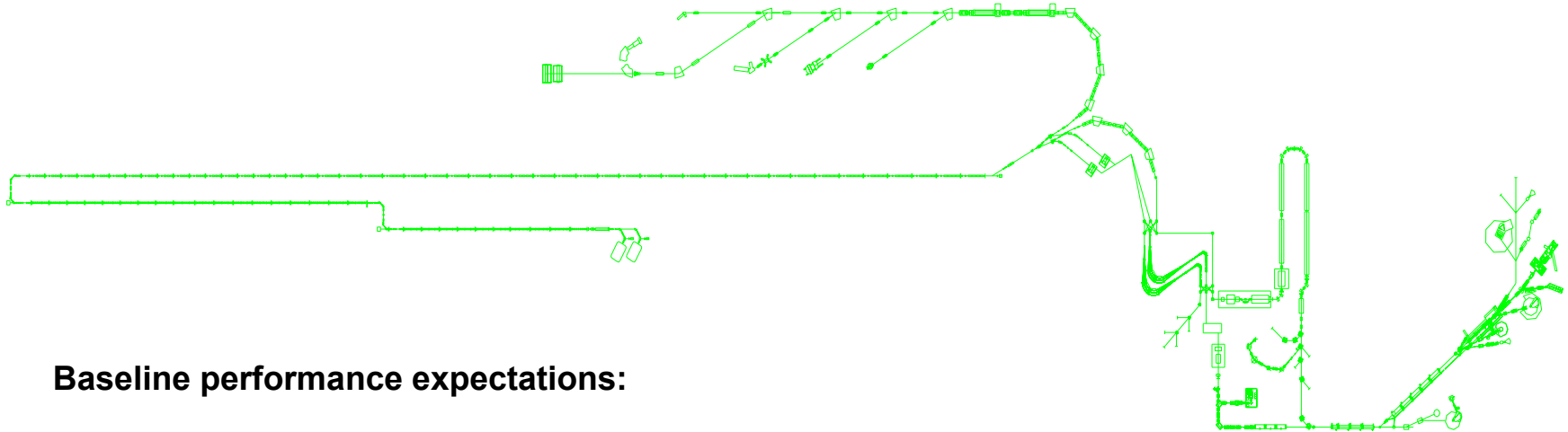


Project Perspective on R&D Priorities

- **Pre-CDR Engineering Baseline - Status**
 - ✓ Translate Physics Description into Physics parameters – **Done**
 - ✓ Turn Physics parameters into a non-site specific engineered layout – **Done**
 - ❑ Verify Harrison Committee Cost Estimate Basis – **Not done yet**
 - ❑ Report on Harrison Committee baseline “Holes” from engineering perspective – **Not done yet**

Project Perspective on R&D Priorities

- **Engineering Layout of 2nd RIA Driver Workshop**

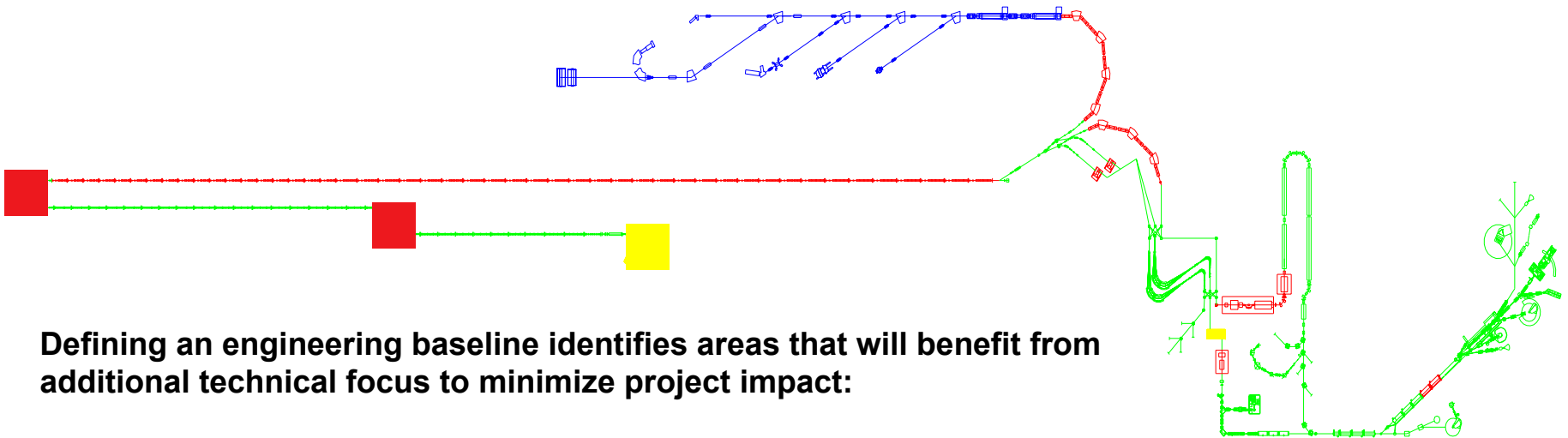


Baseline performance expectations:

- **400 MeV/u (uranium), up to 1 GeV proton**
- **CW SC Drift tube LINAC capable of accelerating 400kW beam**
- **805 Mhz, elliptical cell design**
- **2 Li targets**
- **2 ISOL targets**
- **12.125MHz RFQ and Hybrid RFQ**
- **4 energy regimes for experiments**
- **ATLAS like post acceleration**

Project Perspective on R&D Priorities

- **Engineering Layout of 2nd RIA Driver Workshop**



Defining an engineering baseline identifies areas that will benefit from additional technical focus to minimize project impact:

- Multi-charge state injector system
- Thin film strippers
- High energy portion of driver LINAC
- Fragment Separator and production targets
- Hybrid and 12.125 Mhz RFQ's
- Charge breeder concepts
- Baseline for Post Acceleration functional performance criteria
- RIA experimental equipment layouts

Color Legend:

Red = Highest Potential for project impact

Blue = Moderate Potential for project impact

Yellow = Lowest Potential for project impact

Green = No anticipated project impact

Project Perspective on R&D Priorities

- **Results Summary**

- When we combine the initial Risk Assessment results with the Engineering assessment we are able to:
 - ✓ *Summarize the 52 risk and opportunity items*
 - Six areas of highest consequence and near term “project need” date
 - High energy portion of driver linac
 - Concept supporting the interface of the fragment separator and high power beam dump
 - RFQ prototypes for post acceleration
 - Lithium / Uranium Carbide production target concept update
 - Thin film stripper concept update
 - Multi-charge state injector concept
 - ✓ *Rank the risks and prioritize according to the projects ability to:*
 - Accept the risk
 - Mitigate the risk - *such investments from the RIA R&D program, or*
 - Avoid the risk through other means – such as contracting mechanisms

Project Perspective on R&D Priorities

Appendix B - Risk Assessment Summary

Risk Summary	Cost			Technical			Schedule			Likelihood of success / failure			Risk Rating			What do we do about it?			Comments and approach for mitigation actions	Risk Retire Date	Priority Rank
Project Element	H	M	L	H	M	L	H	M	L	VL	L	UL	H	M	L	Ac	M	Av			
Front End			X		X			X		X				X							
Driver Ion Source																					
1. ECR / Venus			x		x			x		x						x			Continue commissioning	E.O. FY '04	4
2. Critical Beams			x		x			x		x						x			Background operational system R&D at all RIB facilities.	E.O. FY '04	
Driver Front End																					
3. 2-q LEPT			x	x				x		x							x		Invest in RFQ prototyping effort using 2004 LDRD or RIA Programmatic R&D	CD-1	1
4. RFQ Fab		x			x			x			x						x			CD-1	
LINAC	X				X		X			X			X								
Resonators																					
5. DT Resonators	x				x		x			x							x		Complete Prototypes in 2004	CD-1	2
6. Fast Tuners		x				x			x		x					x			Continue SBIR	CD-1	
7. Cryomodules	x				x			x		x							x		Complete Prototypes under ATLAS AIP funding.	CDR	1
Ellipticals																			Complete the prototype(s) and recommend the RIA R&D Program continues to focus on improving life cycle operation of RIA.	CDR	
8. Beta 0.48		x			x			x			x						x			CDR	
9. Beta 0.6	x				x			x			x						x			CDR	
9. Beta 0.8	x				x			x			x						x			CDR	
Spoke Cavities																				CDR	1
10. 3-spoke	x				x			x			x						x			CDR	
11. Cryo/ Gradient analysis	x				x			x			x					x			Accept this risk if 4.2K operation is realistic.	CDR	
Beam Dynamics	X				X			X			X			X							
12. End-to-end model	x				x			x			x						x		Code is complete but significant effort is required to ensure application specific results. High priority to continue in 2004.	CDR	2
13. Errors / losses	x				x			x			x						x			CD-1	
14. Spoke vs. Elliptical model	x				x			x			x						x			CDR	
15. Focus / Steering		x			x			x			x						x			CD-1	
16. Stripper requirement model			x		x				x		x						x			CD-1	
Facility Impacts	X				X			X			X			X							
Radiological Issues																					
17. Tunnel		x				x				x	x					x			No additional effort recommended prior to CDR.		3
18. Targets		x				x				x	x					x					
19. Soil		x				x				x	x					x					
20. Inventory / Facility Class.		x				x				x	x					x					
Multiple User Issues																					
33. RF Switching	x				x				x		x						x		Isotope application workshop is an important input to these R&D issues which affect conventional construction	CD - 1	
34. Breeder Options		x			x				x			x					x				
35. Isotope Harvesting		x			x				x			x					x				
36. Target Options		x			x				x			x					x				

